

2.0 DESCRIPTION OF ALTERNATIVES

An alternative study using the System Engineering (SE) approach was performed to identify the best alternative(s) for replacing and/or restoring the steam production capability at the Y-12 Complex (DOE 2004a). The alternative study first identified a problem statement, “provide steam to meet Y-12 demands through the year 2030.” The study then established requirements that must be met by every viable alternative. These requirements include:

1. The peak steam flow rate shall meet Y-12 Complex requirements.
2. Steam supply must be continuous and uninterruptible including during the transition period (i.e., between the current state and any alternative selected).
3. Environmental regulations and national codes and standards compliance must be ensured.

The following goals were then identified:

1. Maximize reliability, availability, and maintainability of steam supply.
2. Maximize security of steam-generating facility and required energy sources.
3. Minimize impact on health and safety of workers and the public.
4. Maximize compliance with laws, regulations, DOE Orders, etc.
5. Minimize time of implementation.
6. Maximize reduction of deferred maintenance backlog/plant footprint.
7. Maximize ability to respond to reduced demand (i.e., modernization evolution and mission changes).
8. Maximize ability to respond to changes in imposed requirements.
9. Minimize lowest net present value.
10. Minimize unit steam cost to end user.
11. Minimize near-term appropriations for capital projects (2005-2010).
12. Maximize conformity with available funding and associated profiles.
13. Optimize load profile.
14. Minimize steam supply infrastructure.

Goals are different from the requirements in that they are desirable, but not mandatory. In some cases, the goals listed above represent capabilities or attributes that exceed the minimum requirements.

In addition, the alternative study also considered the following assumptions in the selection of the alternatives:

- The information used in the study is based on the FY2007 version of the *Ten-Year Comprehensive Site Plan* and on a Draft Modernization Plan.
- The use of the year 2035 is based on a 25-year life for a new facility coming on-line in 2010.
- Any life extension of the existing Y-12 Steam Plant should have a useful life only through the year 2025, after which a new steam supply will have to be provided.
- The available NNSA funding for the project will not exceed \$50 million, based on the Integrated Construction Project Plan.

Alternatives that can potentially perform the function and meet the requirements were identified. The SE approach was used in the evaluation of alternatives; and the alternatives were ranked using the Analytical Hierarchy Process (AHP) method. The AHP method was used to determine the relative importance, or weight for the following five criteria: (1) maximize reliability, availability, and maintainability of steam supply; (2) minimize time of implementation; (3) maximize lowest net present value; (4) maximize reduction of deferred maintenance backlog/plant footprint; (5) minimize unit steam cost to end user.

Ten viable alternatives were initially identified by NNSA. After each alternative was evaluated using the five criteria listed above, three alternatives were rated to be the most viable. The top three alternatives identified by NNSA:

- Life Extension (Alternative 2 – Life Extension of Existing Steam Plant)
- Three Small Plants
- New Gas Fired Plant

Alternative 1 (discussed below) is a variation of Three Small Plants and the New Gas Fired Plant Alternatives.

2.1 **Alternative 1 – Skid Mounted Gas Fired Boilers (Proposed Action)**

Under the Proposed Action, the boiler house for the packaged boiler system technologies that use natural gas as the primary fuel source and oil as the secondary source would be constructed on the site that is currently occupied by office buildings (Figure 2.1-1). These buildings are slated for demolition and removal in FY 2007. The Infrastructure Reduction (IR) program will remove the existing structures to grade (which will be financed by the SPLE Project – SPR Subproject); however, IR demolition does not include concrete slab-on-grade or foundations for each building. Soil characterization sampling has been completed and results provided in the BWXT Y-12 Complex report, *Steam Package Plant and Oil Tank Farm Report on Site Characteristics and Sample Locations* (RP-PJ-940107-A002).

The packaged boiler system would include four 80,000 pound/hour water tube packaged boilers with low NO_x burners, a flue gas recirculation system, forced draft fans, economizers, stacks, and local controls for natural gas primary fuel and No. 2 fuel oil as a secondary fuel source. The storage site for fuel would be located at the vacant area



Water-Tube Packaged Boiler

east of the proposed location for the boiler house (Figure 2.1-1) and the oil would consist of 200,000 gallon diked maximum storage (no less than two 100,000 gallon steel above ground storage tanks).

This packaged boiler alternative would allow for a 40 year steam plant operational life and would accommodate modernization, changes in the production activities, and infrastructure reduction activities that are part of the modernization vision in the *Y-12 National Security Complex Strategic Plan* and the *Ten Year Comprehensive Site Plan for the Y-12 National Security Complex*.

The use of the secondary oil fuel would allow for continuous steam production during curtailment periods of natural gas and other upset conditions when steam demand exceeds the

available production capacity using the primary, natural gas, fuel source. Economizers and heat exchangers would be incorporated to maximize boiler efficiency and extend equipment process life. The new package boilers will be designed with a heat input capacity less than 100 million Btu/hr. The packaged boiler system would include sufficient capacity and redundant equipment and components to ensure reliability. The packaged boiler system would tie into existing potable water, electrical, natural gas, steam distribution systems and other utilities. Figure 2.1-2 displays the location of the proposed natural gas line replacement. Fuel oil storage tanks and transfer of fuel oil from delivery trucks to the tanks will be located within a concrete secondary containment and transfer station structure that will conform to the Y-12 Complex standard, Y/TS-104, Standards for Primary and Secondary Containment Systems and transfer stations. The secondary containment structure will be sized to contain the volume of one tank, plus the volume of rainwater from 100-year, 24-hour storm events, plus the appropriate fire water volume. Waste streams from the packaged boiler systems will not be treated using existing waste water treatment systems. New waste streams will discharge directly to the Y-12 sanitary sewer system with pH adjustment and cooling if necessary.

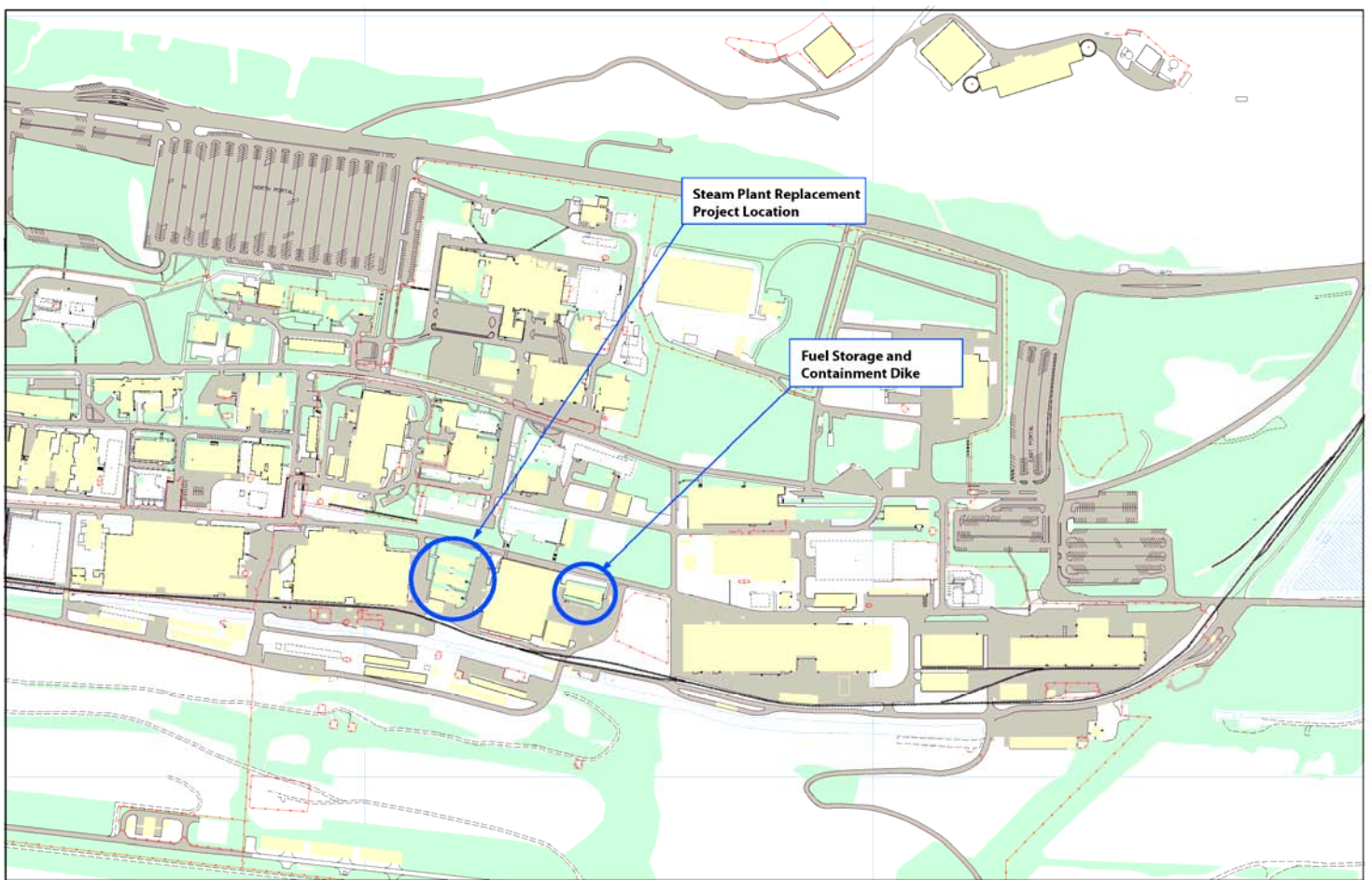


Figure 2.1-1. Project Location.

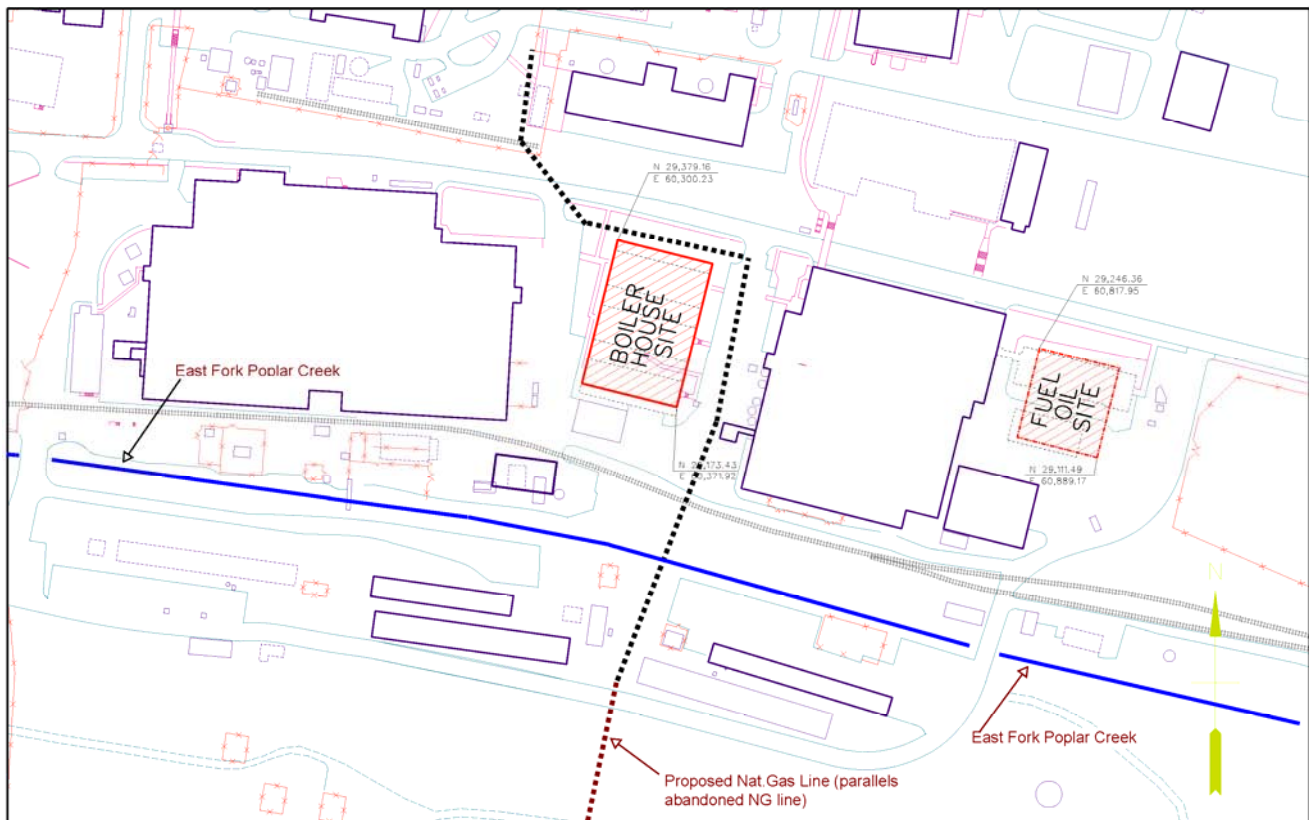


Figure 2.1-2. Location of the Natural Gas Line Replacement.

The packaged boiler system would be housed in a new pre-engineered steel building (boiler house would be constructed on a new concrete foundation).



Pre-engineered Steel Buildings

Operations at the existing Y-12 Steam Plant would cease as activities are transferred to the packaged boiler system. The existing Y-12 Steam Plant facility and coal yard will remain

unused and will require remediation or general surveillance and maintenance until existing structures are removed and will be investigated and remediated under CERCLA.

Site Development. The following site development actions would prepare the project site for construction. Temporary utility services such as electricity, telephone service, and potable water would be provided to the project site from existing Y-12 infrastructure utilities. The top five feet of soil may require removal or replacement with engineered fill after the removal of the existing concrete slab. New foundation and concrete slab will be placed to support the boiler house and the packaged boilers. During construction sanitary service would be provided by collection tanks or portable toilets which would be pumped as needed. Existing roads would support all construction needs.

Erosion and sediment control would be provided prior to any land disturbance to prevent both erosion and transport of sediment beyond the limits of the site. The project site would be graded and topsoil removed and stockpiled according to the *Soil Management Plan for the Oak Ridge Y-12 National Security Complex* (Y/SUB/92-28B99923C-Y05, Rev. 1) with appropriate run-on/run-off protection. Site development activities would be conducted to minimize environmental impacts and to be in compliance with applicable laws and regulations.

Temporary construction fencing, signs and flagging would surround the construction work area to warn and restrict access.

Construction Laydown Area. The construction staging and laydown area will most likely be located on and/or near the construction site. The staging area would be sufficiently graded to accommodate a number of temporary construction trailers, storage buildings, and material storage yards.

2.2 Alternative 2 – Life Extension of the Existing Plant Alternative

Under the Life Extension of the Existing Plant Alternative, replacement and/or repairs to three boilers and the associated auxiliary systems of the existing Y-12 Steam Plant would occur to extend the useful life 10 to 15 years. It would include the repair or replacement of boilers, coal handlers, forced draft system, induced draft system, feed water system, wet ash system, dryash system, wastewater system basin, control room, and electrical systems.

Excavation and backfill activities would be needed under the Life Extension of the Existing Plant Alternative. Excavation and backfill would be required for replacing the existing blowdown drain line along the south side of the existing Y-12 Steam Plant building. There would also be some earthwork associated with storm drain modifications to improve runoff drainage. Upgrades to the Steam Plant Wastewater Treatment Facility would also include excavation and backfill activities relating to foundations for the building extension for the clarifier as well as a foundation for the new sulfuric acid tank.

To restore the condition of the existing steam-generating capability, this alternative would include replacement/renovation of the following items (DOE 2005):

- Boiler systems
- Coal receiving and handling system
- Forced Draft (FD) system
- Induced Draft (ID) system
- Feed water system
- Ash handling system
- Wastewater system
- Control system
- Electrical system
- Structural system
- Security fence

2.3 Alternative 3 – No Action Alternative

Under the No Action Alternative, the existing Y-12 Steam Plant would not be replaced or renovated. The Y-12 Complex would have to spend additional operating funds to maintain the existing Y-12 Steam Plant or continue to operate with a system only marginally capable of meeting operational needs. Parts would be replaced, as required, during routine maintenance activities. As a result, there would be a greater risk of system failure.

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